CUSTOMER CYCLING PROGRAM IN THE CITY OF WEIMAR

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ABSTRACT

The City of Weimar Conservation/Load Management (CLM) Program demonstrates to other small Public Power Systems that a small city electric distribution system with 1,097 meters serving a population of less than 2,500 can have an effect on electric energy usage and conservation. Although the reduction may be small in KW, the percentages of participation in the program are not; and neither, is the percent of reduction of seven percent (7%) realized by the Cycling Program.

The Weimar Peak Time Intermission Program was implemented in July, 1986 with the assistance of the Guadalupe Valley Electric Cooperative (GVEC). The number of installed devices rose over the first six (6) months from 0 to 325 and remained relatively constant until the City initiated a $2.00 monthly credit per device in October, 1991. Shortly thereafter, we installed another thirty (30) devices and at present have 358 devices installed with the following breakdown:

Central Air Conditioners	126
Heat Pumps	72
Electric Furnaces	30
Water Heaters	130
	358

An outgrowth of the Residential/Small Business Cycling Program has been the commercial rate for businesses using more than 50 KW of demand. This rate is patterned after the LCRA WP-1 Wholesale Rate and a similar rate developed by GVEC. Under this rate measurement of both the Coincident Peak and the Non-coincident Peak is made each month. The charge per kilowatt of demand at the time (one-hour) of LCRA Coincident Peak is significantly higher than off-peak even though there is a seasonal variation between Summer (June-September) and Winter (October-May). This rate design gives the business an economic incentive to reduce or shift their demand requirements during the monthly LCRA System Peak. The program is voluntary and allows the business to make the decision to reduce or shift demand; and, to select how they wish to reduce KW demand.

INTRODUCTION

The City of Weimar is a Public Power City with an annual load of approximately 8 megawatts. The City purchases wholesale power from the Lower Colorado River Authority (LCRA) and retails to the residential and commercial customers in and around Weimar. The city has a population of 2,052 according to the 1990 Census, with 917 Residential Meters and 180 Commercial Meters. Commercial Customers are further broken down into Small Commercial - 130, Medium Commercial - 35, LP-2 - 14, and LP-3 - 1.

A. The Program Start

In the mid-1980's the City of Weimar, along with other Wholesale Customers of LCRA, was very much interested in Load Management due to efforts being made by LCRA to push Conservation and Load Management as an alternative to building additional generation facilities. LCRA had hired an engineer from a power company in Georgia where residential cycling devices had been installed and operated and various other conservation measures had been tried. In the same time frame, the Guadalupe Valley Electric Coop (GVEC), headquartered in Gonzales, Texas, had already started installing residential and small commercial appliance cycling devices. GVEC held seminars at their location for any of the Wholesale Customers of LCRA who were interested in Load Management and in particular the cycling program. Although LCRA appeared to be interested in residential appliance cycling they were not moving very quickly in that direction. Therefore, we started talking with GVEC about their program and how we could become a satellite station. We found, through a proposal that they made to us, that we could be handled just as if we were one of their substations. Of course we would have to pay for the cost of installing the cycling equipment and the monitoring devices at our substation. They agreed to assist in installing the equipment and were willing to program their computer to handle us as well.

The primary incentive for a Load Management Program in the LCRA area is, and was even at that time, the Wholesale Power Rate that is charged by LCRA. This overhead depicts what the rate was in 1986 and what it is at the present time. The capacity

Table 1. Wholesale Power Rate - 1986 & Current, Lower Colorado River Authority

Charge	1986	Current (May 1991)
Customer	$36.00	$1,000.00
Capacity (kW)	$4.36	
Summer		$8.722
Winter		$6.230
Delivery (kW)	$0.80	$1.793
Energy (kWH)	$0.002987	$0.006841
Fuel (kWH)	$0.01675	$0.014088

KW charge is the actual kilowatt demand used by the Wholesale Customer during the LCRA System Peak Hour in every month. During the latest rate case before the Public Utility Commission this was further broken down into Summer (June, July, August, September) and Winter (all other months). Since 1986 the wholesale cost of electricity has gone up but the spread between Capacity Charge and Delivery Charge has lessened slightly.

We have found over the years that the LCRA Peak is very much weather sensitive. In the summertime the Peak almost inevitably occurs between 3:00 and 7:00 in the evening and in the winter time between 7:00 and 11:00 in the morning. In the shoulder months, those months between the Summer months and the real Winter months, it is sometimes very difficult to determine when the Peak will occur. It usually occurs in response to weather extremes, either hot or cold, which can and will occur during those shoulder months.

With the assistance of GVEC and personnel from LCRA we installed the various equipment at our substation. The cost of the equipment was about $32,000, while the cost of labor to install the units was about $7,000. The City started the Peak Time Intermission Program in July, 1986. Prior to the start of the installation we held a very extensive advertising campaign in both the newspapers and on radio. We produced short, 30-second public service radio announcements and ran several paid ads in the local newspaper as well as news stories by our local editor. In addition to that we sent out a Peak Time Intermission Card to every utility customer. We then sent out a second card to every electric customer who used an average of 2,000 KWH per month or more. We felt that these customers would be the ones who would be installing the devices. Under the program we installed load control devices on central air conditioners, heat pumps, water heaters, and electric furnaces owned by our customers who volunteered for Peak Time Intermission. The program was established to control these appliances during the LCRA Peak or whenever the LCRA Peak was expected to occur during the month. This means that most months we are under load control more than one time. If the GVEC computer program indicates that the LCRA Peak is nearing or is likely to occur within the hour, we will start into Load Control and gradually build up to 100% Load Control; but if the Peak does not occur at that time we will initiate load control on another day in the month.

All of our Load Control Devices are operated by power line carrier codes specific to the various addresses. The address is a coded protocol that allows each device to be contacted and operated.

The water heaters have a 15-minute timer and are normally coded with an all-seasons address. The heating and cooling devices (heat pumps) have a 7_-minute timer and are coded with an all-seasons address. Central air conditioning units, where there is no electric heat, have a 7_-minute timer and are coded with a summer address only. Central electric furnaces, where there is no cooling, have a 7_-minute timer and are coded with a winter address only.

B. Number of Devices Installed

Within the first six months we installed about 325 devices; this number remained relatively

Table 2. Number of Installed Devices

Water Heaters	130
Central Air Conditioning	126
Heat Pumps	72
Electric Furnaces	30
Special Commercial Rate	15

constant until the city initiated a $2.00 monthly credit per device in October, 1991. Shortly thereafter we installed another 30 devices and at present we have 358 devices installed with the following breakdown: 130 Water Heaters, 126 Central Air Conditioners, 72 Heat Pumps, and 30 Electric Furnaces.

C. Measurement of Reduction and Savings

It is very difficult to document actual reductions or savings. In shaving the peak the actual number of kilowatts saved is not measurable since the demand that might have been reached is unknown. The City of Weimar, LCRA and Guadalupe Valley Electric Coop have all done estimates based on statistical information developed in Georgia. There really have not been very many studies done on reduction during the winter months which can be used to develop statistical data. However, it has been proposed by the LCRA that the reduction realized by cycling heat pumps and electric furnaces could be as high as 2.5 KW per unit. According to these statistics, when applied to the devices in Weimar, peak demand can be reduced by 1 KW per air conditioner through cycling and .5 KW should be realized by cycling water heaters at any time whether it be summer or winter. The reason for such a small amount on the water heaters is that if there is no demand for hot water at the time the appliance is turned off then there is really no savings.

A second method of measurement was developed by GVEC. GVEC installed some very sophisticated weather reporting equipment and using a similar or "like day" for weather they were able to estimate what their own system peak would have been if the KW usage had continued to rise at the same rate. They have refined this method over the

Table 3. Measuring Reduction - Amount of KW saved based on Statistical Studies

SUMMER MONTHS (June, July, August & September)	
Air Conditioning & Heat Pumps (198 @ 1 kW)	198 kW
Water Heaters (130 @ .5 kW)	65 kW
	253 kW
WINTER MONTHS (All the Rest) Heat Pump & Electric Furnace (102 @ 2.5 kW)	255 kW
Water Heaters (130 @ .5 kW)	65 kW
	320 kW

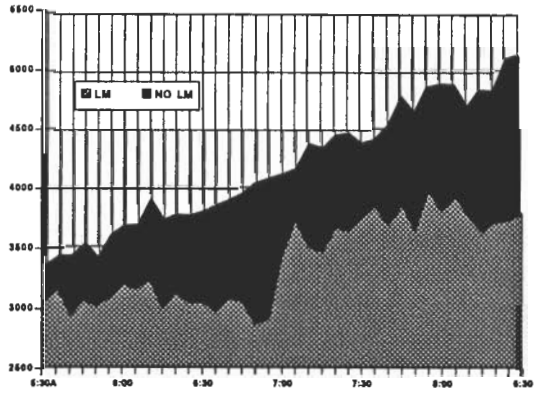

Figure 1. Weimar Load Management for December 1993.

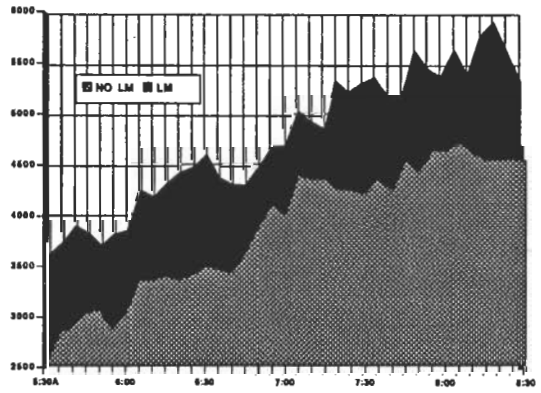

Figure 2. Weimar Load Management for January 1994.

years to using a "similar load shape day" to measure against. They can then compute the KW reduction brought about by load control. There are two problems with this methodology: 1) It's not often that you have a similar weather/load shape day that you didn't load control; and 2) If the weather was just enough off that you didn't load control on that day then your calculations or statistics could be off as well. Regardless of the problems the "similar load shape day" estimate seems to be a more accurate than the statistical estimate. This is particularly true for a small system. Another factor that can throw the estimates off is the varying weather conditions between locations within the LCRA Customer Service Area. LCRA wholesale customers are located all the way from McCulloch County, North of Brady, Texas, Southeast into Wharton and DeWitt Counties. Weather conditions in the Hill Country can be very different from those near the Coast. It can be hot and sweltering in Cuero or Weimar, but cool and dry in Fredericksburg or Llano. The problem is that we are concentrating our efforts on avoiding the LCRA Peak which generally occurs when most of the LCRA area is having a heat problem or a cold problem.

D. Problems Encountered

We were asked to comment on any problems we encountered with regard to the cycling program. The problem most to be avoided is customer dissatisfaction. However, no matter what you do or how you plan the program there will always be some customers who are unhappy with the results. I am sure that most of you can tell horror stories as well as I, but I am the one that gets to tell them right now. We had one customer who would sit next to the outdoor unit of his air conditioner, outside the house, and time the number of minutes and seconds that it was actually off and the time it was on during a load control period. Then he would report to us that it was not cycling and staying off for exactly 7_ minutes or that it was going back off before the 15 minutes was up. We also had two customers whose water heaters were not sufficient to supply the amount of hot water that they needed. One family consisted of a family of four, two of whom were teenagers. When the load management device turned the water heater off he simply didn't have enough hot water. In cases like this we didn't try to explain too much. We simply removed the device and said thank you for your help. I am very pleased to say that for the most part very few people have asked that the devices be removed.

A second problem we had was in using local air conditioning contractors to install the devices. We had prepared a check sheet for them to follow but found that the contractors didn't make all the checks leaving the city open to possible liability. We also found the contractors were very possessive of their customers and feared that if someone else installed the device they could lose that customer. Considering these problems, I would have to recommend that you train your own people to install the devices.

E. Commercial Load Management

An outgrowth of our residential cycling program is the commercial load management program. The city's new commercial rate (LP-2 & LP-3) for businesses that use more than 50 KW of demand is patterned on the LCRA Wholesale Rate and a similar rate schedule that was developed by GVEC. It gives the business an economic incentive to reduce or shift its demand requirements during the monthly LCRA System Peak. The program in Weimar has been voluntary in that it allows the business to make its own decision on how it can best reduce or shift the KW from the peak time and to make that selection as great or as small as necessary for that particular day. A load management device is installed at a location in the business suitable to the manager or foreman. When we start load control a signal is sent to the device causing it to sound an alarm and light up. The device may or may not control other alarms or

Table 4. City of Weimar Commercial Electrical Rate (LP-2 & LP-3)

Charge	LP-2	LP-3
Customer	$ 30.00	$ 50.00
Coincident Peak (kW)		
Summer	$ 9.50	$ 8.80
Winter	$ 6.80	$ 6.30
Non-Coincident Peak (kW)	$ 3.60	$ 3.50
Energy Charge (kWH)	$ 0.02436	$ 0.02066
Wholesale Power Cost Adjustment (WPCA)	$ 0.006332	$ 0.006332

appliances; that is a decision that the business owner must make. The business owner must then decide what and how much load he can drop; or, if he considers it necessary, he can continue to operate at 100% right on through the Load Control Period. LCRA has been maintaining records on the commercial customers involved and interpreting the data to determine how much load has been shed by the business concerned. The LCRA Conservation and Load Management Division has provided me with some of that data.

Table 5. Data from LCRA Conservation and Load Management on Two city of Weimar Customers

MONTH	M-G FEED	UTEX
January		
February		
March	78 KW	
April		
May	105 KW	300 KW
June	40 KW	1500 KW
July	216 KW	807 KW
August	139 KW	253 KW
September	280 KW	360 KW
October	200 KW	350 KW
November		180 KW
December		320 KW
TOTAL	1,058 KW	4,070 KW

Prior to the effective date of the implementation of the commercial program, the city contacted each of the customers with a letter explaining the new rate and its purpose. In addition a short manual on electric demand was developed which explained the LCRA monthly peak and how best to shed load at the time of the peak. Visits were made to the businesses to determine what the business could do and to assist them in making determinations in what loads to shift. We worked with the customers that had questions or who appeared not to be taking advantage of the program.